CLAIMS

1. A cable comprising at least one conductor, an insulating layer which forms a ceramic when exposed to an elevated temperature and at least one additional heat transformable layer which enhances the physical properties of the insulating ceramic forming layer at least during or after exposure to an elevated temperature.

2. The cable of claim 1, wherein the insulating layer forms a self supporting ceramic layer when exposed to the elevated temperatures experienced in a fire.

3. The cable of claim 1 or 2, wherein the physical properties of the insulating ceramic forming layer enhanced by the at least one additional heat transformable layer are selected from the group consisting of:

   i) the mechanical strength of the combined layers before, during or after exposure to fire,

   ii) the structural integrity of the ceramic forming layer after exposure to fire;

   iii) the resistance to the ingress of water of the combined layers after exposure to fire; and

   iv) the electrical or thermal resistance of the combined layers during and after exposure to fire.

4. The cable of claim 1 or 2, wherein the at least one heat transformable layer is a second ceramic forming layer which is extruded with the insulating layer onto the conductor and forms a ceramic that is self supporting when exposed to elevated temperatures.

5. The cable of claim 2 where the second ceramic formed is stronger than that formed by the insulating layer.

6. The cable of claim 2, wherein the second ceramic forming layer comprises an organic polymer, an inorganic refractory filler and an inorganic phosphate.

7. The cable of claim 6, wherein the inorganic filler is a silicate mineral filler.

8. The cable of claim 6, wherein the inorganic phosphate is ammonium polyphosphate.

9. The cable of claim 8, wherein the ammonium polyphosphate is provided in the range of 20-40 wt.% based on the total weight of composition.

10. The cable of claim 6, wherein the second ceramic forming layer further comprises additional inorganic filler and additives selected from the group consisting of oxides and hydroxides of magnesium and aluminium.

11. The cable of claim 10, wherein the additional inorganic filler is aluminium hydroxide.

12. The cable of claim 1 or 2, wherein the at least one heat transformable layer is a sacrificial layer provided on the metal conductor, the layer being formed of a composition comprising an organic polymer and an inorganic filler.

13. The cable of claim 12, wherein the sacrificial layer decomposes at or below the elevated temperature, resulting in formation of a layer of the inorganic filler between the substrate and the ceramic such that bonding of the ceramic to the metal conductor is minimised or prevented.

14. The cable of claim 13, wherein the sacrificial layer comprises at least 50 wt.% inorganic filler.

15. The cable of claim 12, wherein the organic polymer in the sacrificial layer decomposes at or below the temperature at which the ceramic forming layer forms a ceramic.

16. The cable of claim 12, wherein the organic polymer in the sacrificial layer leaves little or no residue on thermal decomposition.

17. The cable of claim 12, wherein the thickness of the sacrificial layer is 0.2-2 mm.

18. The cable of claim 12, wherein the inorganic filler is magnesium hydroxide.

19. The cable of claim 1 or 2, wherein the at least one heat forming layer is a glaze forming layer comprising a component which after exposure at an elevated temperature, cools to form a glaze layer which is substantially impervious to water.

20. The cable of claim 19, wherein the glaze forming layer comprises two or more glaze forming components.

21. The cable of claim 19, wherein the glaze forming components are selected from the group consisting of combinations of two or more materials that react/combine to form a molten glass at elevated temperate, glasses or mixtures of glasses that soften/melt at elevated temperatures associated with a fire.

22. The cable of claim 19, wherein the composition making up the glaze forming layer further comprises a carrier component which enables the glaze forming layer to be co-extruded with the ceramic forming layer onto the conductor.

23. The cable of claim 22, wherein the weight ratio of the glaze forming component to carrier component is in the range of 0.9:1 to 1.2:1.

24. The cable of claim 1 or 2, wherein the at least one additional layer is an operational strength layer.

25. The cable design of claim 1 or 2, wherein the at least one additional layer is a sheathing layer which forms a weaker self supporting ceramic at elevated temperatures associated with a fire.

26. A method of producing a cable comprising the steps of extruding an insulating layer onto a conductor, the insulating layer forming a self supporting ceramic when exposed to an elevated temperature and extruding at least one auxiliary layer being transformable during exposure to temperatures associated with a fire to enhance the physical properties of the ceramic forming layer.

27. The method of claim 26, wherein the properties enhanced by the at least one auxiliary layer are at least one of:

i) the mechanical strength of the combined layers before, during or after exposure to fire;

ii) the structural integrity of the ceramic forming layer after exposure to fire;

iii) the resistance to the ingress of water after exposure to fire; and

iv) the electrical or thermal resistance of the combined layers during and after exposure to fire.

28. The method of claim 26, wherein at least one auxiliary layer comprises a second ceramic forming layer that forms a ceramic that is self supporting and of different strength when exposed to elevated temperatures.

29. The method of claim 28, where the second ceramic formed is stronger than that formed by the insulating layer.

30. The method of claim 29, wherein the second ceramic forming layer comprises an organic polymer, an inorganic filler and an inorganic phosphate.

31. The method of claim 30, wherein the inorganic phosphate is ammonium polyphosphate.

32. The method of claim 31, wherein the ammonium polyphosphate is present in the amount of 20-40% by weight of the total composition.

33. The method of claim 30, wherein the inorganic refractory filler is a silicate mineral filler.

34. The method of claim 30, wherein the second ceramic forming layer further comprises additional fillers and additives selected from the group consisting of oxides and hydroxides of magnesium and aluminium.

35. The method of claim 34, wherein the additional filler or additive is aluminium hydroxide.

36. The method of claim 26, wherein the at least one auxiliary layer is a sacrificial layer provided on the conductor, the layer being formed of a composition comprising an inorganic polymer and an inorganic filler.

37. The method of claim 36, wherein the sacrificial layer comprises at least 50 wt.% inorganic filler.

38. The method of claim 37, wherein the inorganic filler is magnesium hydroxide.

39. The method of claim 36, wherein the thickness of the sacrificial layer is 0.2-2 mm.

40. The method of claim 26, wherein the at least one auxiliary layer is a glaze forming layer which after exposure at an elevated temperature, cools to form a glaze layer which is substantially impervious to water.

41. The method of claim 40, wherein the glaze forming layer comprises at least one glaze forming component and a carrier component, the weight ratio of the at least one glaze forming component to carry component is in the range of 0.9:1 to 1.2:1.

42. A method of designing a cable comprising the steps of:

selecting an ceramic forming layer for extrusion onto a conductor, the ceramic forming layer forming a self supporting ceramic layer when exposed to the elevated temperatures experienced during a fire;

determining the properties of the ceramic forming layer before, during and after exposure to the fire;

selecting a material for a secondary layer which enhances the physical properties of the ceramic forming layer; and

extruding the ceramic forming layer and the at least one auxiliary layer onto a conductor.

43. A fire performance article comprising a metal substrate, a protective layer which forms a ceramic when exposed to an elevated temperature and at least one heat transformable layer which enhances the physical properties of the protective ceramic forming layer during or after exposure to an elevated temperature.

44. The article of claim 43, wherein the physical properties of the protective ceramic forming layer enhanced by the at least one additional heat transformable layer is selected from the group consisting of:

i) the mechanical strength of the combined layers before, during or after exposure to fire,

ii) the structural integrity of the ceramic forming layer after exposure to fire;

iii) the resistance to the ingress of water of the combined layers after exposure to fire; and

iv) the electrical or thermal resistance of the combined layers during and after exposure to fire.

45. The article of claim 43, wherein the at least one heat transformable layer is a second ceramic forming layer which forms a ceramic that is self supporting and of different strength.

46. The article of claim 45, where the second ceramic formed is stronger than that produced by the other ceramic forming layer.

47. The article of claim 45, wherein the second ceramic forming layer is applied over a metal substrate and comprises an organic polymer, an inorganic filler, and an inorganic phosphate.

48. The article of claim 47, wherein the inorganic phosphate is ammonium polyphosphate.

49 The article of claim 48, wherein the ammonium polyphosphate is provided in the range of 20-40 wt.% based on the total weight of composition.

50. The article of claim 47, wherein the inorganic refractory filler is a mineral silicate.

51. The article of claim 47, wherein the second ceramic layer further comprises additional fillers and additives selected from the group consisting of oxides and hydroxides of aluminium and magnesium.

52. The method of claim 51, wherein the additional filler or additive is aluminium hydroxide.

53. The article of claim 44, wherein the at least one heat transformable layer is a sacrificial layer provided on the metal substrate, the layer being formed of a composition comprising an organic polymer and an inorganic filler.

54. The article of claim 53, wherein the sacrificial layer decomposes at or below the elevated temperature, resulting in formation of a layer of the inorganic filler between the metal substrate and the ceramic such that bonding of the ceramic to the substrate is minimised or prevented.

55. The article of claim 54, wherein the sacrificial layer comprises at least 50 wt.% inorganic filler.

56. The article of claim 44, wherein the at least one heat forming layer is a glaze forming layer comprising a component which after exposure at an elevated temperature, cools to form a glaze layer which is substantially impervious to water.

57. The article of claim 56, wherein the glaze forming components are selected from the group consisting of combinations of two or more materials that react/combine to form a molten glass at elevated temperate, glasses or mixtures of glasses that soften/melt at elevated temperatures associated with a fire.

58. The article of claim 56, wherein the composition making up the glaze forming layer further comprises a carrier component which enables the glaze forming layer to be applied to the ceramic forming layer.

59. The article of claim 43, wherein the at least one additional layer is an operational strength layer.

60. The article of claim 43, wherein the at least one additional layer is an operational layer which forms a weaker self supporting ceramic at elevated temperatures associated with a fire.

61. A method of producing a fire performance article comprising the steps of applying a ceramic forming layer onto a metal substrate, the ceramic forming layer forming a self supporting ceramic when exposed to an elevated temperature and applying at least one auxiliary layer being transformable during exposure to temperatures associated with a fire to enhance the physical properties of the ceramic forming layer.

62. The method of claim 61, wherein the properties enhanced by the at least one auxiliary layer are at least one of:

i) the mechanical strength of the combined layers before, during or after exposure to fire;

ii) the resistance to the ingress of water after exposure to fire;

iii) the structural integrity of the ceramic forming layer after exposure to fire; and

iv) the electrical or thermal resistance of the combined layers during and after exposure to fire.

63. The method of claim 62, wherein at least one auxiliary layer comprises a second ceramic forming layer which forms a ceramic that is self supporting and of different strength.

64. The method of claim 63, where the second ceramic formed is stronger than that produced by the other ceramic forming layer.

65. The method of claim 63, wherein the second ceramic forming layer comprises an organic polymer, an inorganic refractory filler and an inorganic phosphate.

66. The method of claim 63, wherein the inorganic phosphate is ammonium polyphosphate.

67. The method of claim 66, wherein the ammonium polyphosphate is provided in the range of 20-40 wt.% based on the total weight of composition.

68. The method of claim 62, wherein the at least one auxiliary layer is a sacrificial layer provided on the conductor, the layer being formed of a composition comprising an inorganic polymer and an inorganic filler.

69. The method of claim 68, wherein the sacrificial layer comprises at least 50 wt.% inorganic filler.

70. The method of claim 62, wherein the at least one auxiliary layer is a glaze forming layer which after exposure at an elevated temperature, cools to form a glaze layer which is substantially impervious to water.